Preparing a Thesis With LaTeX

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1 About the Thesis Class

The Rensselaer LaTeX thesis document class, available for download on the Web, can be used to produce either a master's or a doctoral thesis with a format that meets the requirements of the Office of Graduate Education.

The Thesis document class allows you to generate:

- title page
- abstract title page
- copyright page (*optional*)
- lists of contents (table of contents, list of tables, and list of figures)
- acknowledgment, preface, etc.
- abstract
- chapters with numbered headings and subheadings
- bibliography
- appendices

Although the thesis document class produces an acceptable format, you should be familiar with the regulations on thesis preparation produced by the Office of Graduate Education. The OGE Thesis Writing Manual, which includes information on electronic submission, is available online at http://www.rpi.edu/dept/grad/docs/ThesisGuide/manual.pdf

The Rensselaer LaTeX Thesis web page provides information on writing a thesis with LaTeX, including documentation and files for download. You can reach this page easily from the Help Desk web page: in the Quick Links drop-down menu, select "Prepare a thesis". If you are not familiar with LaTeX, first read the ARC tutorial, *Text Formatting with LaTeX* (formerly Memo RPI.109), which will get you started. You can print it from the Thesis web page, or pick it up free of charge at the VCC Help Desk.

Another good source of information is the Rensselaer LaTeX information web page, http://www.rpi.edu/dept/arc/training/latex/. In addition to course material, this page has links to various useful documents and a number of LaTeX examples.

The complete reference for LaTeX is the *LaTeX User's Guide* by Leslie Lamport. Since the thesis class is based on the standard LaTeX class `report`, the information in this book and in the ARC tutorial, *Text Formatting with LaTeX*, applies to using the thesis class as well as standard classes. Any differences are described in this document.

The thesis class and the template files described in this document can be used on any system with LaTeX, which includes Windows machines, Macs, or Linux/Unix systems. It is assumed that you know how to run LaTeX on your system. Note, however, that using RCS Unix is not recommended because it is no longer actively maintained, and its LaTeX programs and packages are not recent enough.

2 Downloading the Thesis Class

To use the thesis class on your personal computer, you first need to download the file `thesis.cls` from the LaTeX Thesis web page. You can either put it in the folder with your thesis material (to use it only with documents in that folder), or place it in the standard TeX input path for your system, along with all the other files that end in `.cls` or `.sty`. If you do the latter, it's best to put `thesis.cls` in a folder you create in a "local tree" to preserve it in the case of future TeX upgrades. It is easiest to create the folder first and then download the file `thesis.cls`. For example, If you are using the TeXLive system on a Windows machine and have installed under `C:\TeXLive2005`, the folder name will be:
`C:\TeXLive2005\texmf-local\tex\latex\thesis\`.

After downloading the file, check that Windows has not named it `thesis.cls.txt` instead of `thesis.cls`! Then, if you've chosen to put it in TeX's input path, be sure to rebuild the "ls-R" filename database: for a TeXLive installation on Windows, go to Start `->` Programs `->` TeXLive and follow the appropriate links from there.

3 Using the Template Files

For a quick start, you can use the *template* (or *prototype*) files. You can download these template files from links on the LaTeX Thesis web page or directly from
`http://www.rpi.edu/dept/arc/docs/latex-thesis/`. Put them in your own folder or directory that will hold the material for your thesis and from which you will be running LaTeX.

NOTE: To create correct tables of contents and to resolve forward references, remember that you need to run LaTeX or pdfLaTeX twice. This is necessary because the information taken from the auxiliary files, which store this information, is always from the *previous* run.

3.1 Short Thesis

If your thesis is only about 20-30 pages, you will probably want to keep everything in one file. In this case, you can download the template file for a short thesis:
    `rpithes-short.tex`
Replace the text with your own, and run `latex` or `pdflatex` to produce your thesis. A listing of the above file is in is in Appendix A of this document. You'll also need the template for producing the *abstract title page* and abstract, a separate file required by OGE for all theses:
    `abstitle-mas.tex`
Apppendix B lists this template file and the corresponding file for a Ph.D. dissertation.

3.2 Long Thesis

For a longer thesis or dissertation, it will be easier to use separate files for different sections. The set of template files below are designed to do this: each file contains the commands to produce a particular section. The *root* file, `rpithes.tex`, is the file that you supply as input to the LaTeX (or pdfLaTeX) program, and it in turn instructs LaTeX to process the other files.

`rpithes.tex` *(root file)*	`rpiack.tex`	`rpichap2.tex`
`rpititle-mas.tex` *(masters)*	`rpiabs.tex`	`rpibib.tex`
`rpititle-phd.tex` *(Ph.D.)*	`rpichap1.tex`	`rpiapp.tex`

In addition to your thesis or dissertation, you are required to submit a separate file containing just the *abstract title page* and the abstract. You can prepare this file using one of templates:
    `abstitle-mas.tex`   `abstitle-phd.tex`

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These two template files are listed in Appendix B. The listings of the set of template files for a longer thesis are in Appendix C, and the output they produce is included as Appendix D. The *root* file, `rpithes.tex`, is also reproduced below.

After downloading the template files, you will probably want to choose your own names for these files. If you change the file names, be sure to edit the "root file" `rpithes.tex` and change the `\include` statements accordingly. You can then modify the text of the template files and run `latex` or `pdflatex` on the root file.

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                         %
%                     ROOT FILE                           %
% For a long thesis where chapters are in separate files  %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%
%  Run LaTeX or pdfLaTeX on this file to produce your thesis.
%  To produce the abstract title page followed by the abstract,
%  see the file abstitle-phd.tex or abstitle-mas.tex.
%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

\documentclass[chap]{thesis}

% Use the first command below if you want captions over 1 line indented. A side
% effect of this is to remove the use of bold for captions (thesis default).
% To restore bold, also include the second line below.
\usepackage[hang]{caption}       % to indent subsequent lines of captions
\renewcommand{\captionfont}{\bfseries} % bold caption (needed with caption
                                       % package to restore boldface.)
%\includeonly{rpichap1}  % use \includeonly to process only
                         % the file(s) listed inside the braces
\begin{document}

\include{rpititle-mas}   % titlepage material for Master's thesis or project
%\include{rpititle-phd}   % titlepage material for PhD thesis
\include{rpiack}
\include{rpiabs}
\include{rpichap1}
\include{rpichap2}
\include{rpibib}
\include{rpiapp}

\end{document}

%%%%%%%%%%%%%%%%%%%   End of root file   %%%%%%%%%%%%%%%%%%
```

By using a *root* file with `\include` commands, you can produce the entire thesis, or you can use the `\includeonly` command to produce just certain parts. In the prototype file above,

this command instructs LATEX to process only the file *rpichap1.tex*. To process more than one file, include several file names (separated by commas) as the argument to the `\includeonly` command. For example, in the prototype file, the following command would instruct LATEX to process only the files `rpititle-mas.tex` and `rpiabs.tex`.

```
\includeonly{rpititle-mas,rpiabs}
```

To process the entire thesis, comment out the `\includeonly` command by preceding it with a percent sign (%).

4 Thesis Document Class Options

Document class *options*, which are specified in square brackets on the `\documentclass` command, provide various modifications to the formatting of the text. There are several options you may find useful with the thesis class.

4.1 Type Size

By default, the thesis is in 12-point type. Two smaller type sizes, 10 and 11 points, are available as options on the `documentclass` command. For example, to use 11 points, edit the root file (i.e., `rpithes.tex`) and specify

```
\documentclass[11pt]{thesis}
```

4.2 The Chapter Heading Format

Another option, this one unique to the thesis class, is `chap`. The `chap` option writes the word "CHAPTER" on a separate line above the chapter title. If you have included [`chap`] in the `documentclass` command, the line

```
\chapter{INTRODUCTION AND HISTORICAL REVIEW}
```

would produce:

<div align="center">

CHAPTER 1

INTRODUCTION AND HISTORICAL REVIEW

</div>

Without the `chap` option, the chapter title would look like:

<div align="center">

1. INTRODUCTION AND HISTORICAL REVIEW

</div>

Note that if you use two or more options, you must separate them with commas. Therefore, to use both the `chap` option and the 11-point option, use the command:

```
\documentclass[chap,11pt]{thesis}
```

4.3 Twosided Formatting

Although the Office of Graduate Education requires a onesided copy of your thesis, your department or other recipients may be happy with a double-sided copy. If you include `twoside` in square brackets in the `\documentclass` command, your thesis will be formatted for twosided printing. This means that the 1.5 inch margin, which is always the left margin on onesided pages, will cycle so that it is always on the binding edge, and that page numbers, normally in the upper right corner, will cycle so that they are always on the outside edge. (*This option does not force the printer to print double-sided.* To also get twosided printing, you must use a duplex printer, such as VCLW.)

Using the `twoside` option will also ensure that the table of contents does not print on the back of the title page and that the first chapter always starts on a right-hand page. Subsequent chapters, however, will not necessarily begin on a new sheet of paper. To force each chapter to start on a right-hand page, also include the `openright` option:

```
\documentclass[twoside,openright]{thesis}
```

5 Other Features and Considerations of the Thesis Class

The thesis document class contains some features that are not part of the standard LaTeX classes. Most of these are built into the thesis class; a few are provided by *packages*, sets of LaTeX or TeX commands written by users and made available to the LaTeX community. A package often defines totally new commands that add extra features.

5.1 Producing Unnumbered Section Headings and Appendices

The command `\specialhead` produces a section heading similar to those produced by the `\chapter` command but without a number. Use it for Abstract, Acknowledgment, Bibliography, etc.

Note that appendices are produced with the `\chapter` command, but you must have previously included the LaTeX command `\appendix`. (This is documented in the *LaTeX User's Guide* and illustrated in the RPI template file `rpiapp.tex`.) Note the `\appendix` command should appear only *once*, before the first appendix. (Do NOT include it before each appendix.)

5.2 Footnote Numbering

Unlike other LaTeX document classes, which reset the footnote counter to 1 at the start of each new chapter, the thesis class numbers footnotes sequentially throughout the thesis. To start over with number 1 at any time, use the command `\resetfootnote`.

5.3 Figure and Table Captions

Prepare figures and tables using the `figure` and `table` environments as described in the *LATEX User's Guide*, and use the `\caption` command to specify the caption.[1] In the thesis class, table and figure captions are in boldface type by default.

Short captions are centered on the line; captions longer than one line are left-aligned. If you would like to indent subsequent lines of long captions, you can use the `caption` package with the `hang` option to do this. After the `\documentclass` command, include the line:

    \usepackage[hang]{caption}

If you use the `caption` package, your captions will not be bold. However, the package provides the `captionfont` command, which allows you to control the font of the captions. Therefore, to get bold with the `caption` package, follow the above command with the line:

    \renewcommand{\captionfont}{\bfseries}

Note that the above two lines should be part of your *preamble*–that is, after the `\documentclass` command and before the `\begin{document}` command. See the root template file `rpithes.tex` for an example.

5.4 Line Spacing

The spacing of your thesis will be line-and-a-half, which is acceptable to the Office of Graduate Education. This spacing was achieved by using a stretch factor of 1.4, which is just right for typesizes of 12 points (the default) and 11 points. If you choose 10 points, the smallest type size allowed, you should increase the spacing slightly by including in your preamble the command `\setstretch{1.5}`.

The thesis document class defines a new environment called `singlespace`. To single space a section of text inside the otherwise line-and-a-half-spaced thesis, do the following:

    \begin{singlespace}

  put the single-spaced text here

    \end{singlespace}

5.5 Heading Size

If you wish, you can change the type size of your section headings. By default, the chapter and section headings are a little larger than the text, and the subsection and subsubsection headings are the same size as the text. (All headings are boldface.) Below are the heading size commands used by default. You can change any of them by putting a similar command in your preamble with a different size specified.

---

[1]Note: if you are planning to cross-reference the caption, be sure to put the `\label` command *after* the caption.

```
\renewcommand\chaptersize{\large}
\renewcommand\sectionsize{\large}
\renewcommand\subsectionsize{\normalsize}
\renewcommand\subsubsectionsize{\normalsize}
```

5.6   The Bibliography

5.6.1   Using LaTeX's Built-in Method

To prepare a bibliography in LaTeX, you use the command `\cite{key}` within your text to cite various works. "key" is a keyword of your choosing that identifies the work. For example your document might include, at the appropriate places: `\cite{lamport}` `\cite{kopka}` `\cite{goossens}`. These commands place numbers (enclosed in square brackets) in the text that match the numbers which will be automatically generated in the bibliography. (Remember to run LaTeX twice to get correct numbers in the text!) Then, at the end of the document, you put your bibliographic entries in a special environment called `thebibliography`. *Text Formatting with LaTeX* has more information on preparing a bibliography.

This method is illustrated in the sample thesis appended to this document. Note that the entries in the template file `rpibib.tex` are inside the `singlespace` environment. This produces an attractive bibliography and is recommended, though certainly not required.

The alignment of the bibliography section is ragged right by default, because in many cases it looks better. (When fully justified, a bibliography can have some very wide spaces between words.) However, if you prefer that it be fully justified, just put the following command in the preamble: `\renewcommand{\bibalign}{}`

5.6.2   Using BibTeX with the Thesis Class

BibTeX, a separate program included with TeX distributions, generates a list of references from information contained in a bibliographic database—a file you create whose name ends with the extension `.bib`. the There are several books, inluding Leslie Lamport's LaTeX manual, that describe in detail how to use BibTeX and how to prepare the `.bib` file.

If you use one of the basic bibliography styles such as `plain`, `unsrt` or `alpha`, using BibTeX with the thesis class is straightforward. In your `rpibib.tex` file, use `\specialhead` to make an unnumbered heading. Then add the `bibliographystyle` command and the `biblography` command. For example, if the section heading is "REFERENCES," if you are using the `unsrt` bibliography style, and if your database entries are in the file `myrefs.bib`, your `rpibib.tex` file would look like:

```
\specialhead{REFERENCES}
\bibliographystyle{unsrt} % specify bibliography style
\begin{singlespace}
\bibliography{myrefs}  % Prints the bibliography here, using "myrefs.bib"
\end{singlespace}
```

That's all. Just remember that to create the bibliography, you must run LaTeX, then BibTeX, then run LaTeX twice more. Windows editors, such as WinShell and WinEdt, have a button for BibTeX on the toolbar.

If you are further customizing your bibliography by using a package such as natbib[2] or harvard, do not use `\specialhead`. The package will make its own new page and heading, and you don't want two! But you will need to add the command `\addcontentsline` to get the entry into the table of contents. And, if you are using the `hyperref` package to put live links in your PDF file, you'll also need the `\phantomsection` command to put the anchor in the right place. Assuming you want the title to be "REFERENCES" (rather than the default name "BIBLIOGRAPHY"), your preamble would include commands such as:

```
\usepackage{harvard}
\renewcommand\bibname{REFERENCES} % specify name of your heading
```

and your `rpibib.tex` file might look like:

```
\clearpage
\phantomsection        % To make hyperref link in TOC work correctly
\addcontentsline{toc}{chapter}{\bibname} % puts entry in TOC.
\bibliographystyle{agsm}  % specify bibliography style
\begin{singlespace}
\bibliography{myrefs} % Prints the bibliography here, using "myrefs.bib"
\end{singlespace}
```

5.7   Making an Index

An index is not required for your thesis, but you can include one if you would like to. *Text Formatting with LaTeX* includes a section on generating an index, which describes what you need in the preamble and how to index the entries. For more complete information, the documentation that comes with the `makeindex` program, `makeindex.dvi`, should be available on your system.

To print an index at the end of your thesis, there are several commands you will want to use in addition to the usual `\printindex` command. You'll want the Index in the Table of Contents, and you'll want single spacing. You do *not* want to use `\specialhead` because makeindex automatically creates the heading, and you don't want two. And, if you are using the `hyperref` package to put live links in your PDF file, you'll also need the `\phantomsection` command to put the anchor in the right place. You can put these commands in a separate file which you `\include` in your root file. A file named, for example `rpiind.tex`, might look like:

```
\clearpage
\phantomsection        % To make hyperref link in TOC work correctly
\addcontentsline{toc}{chapter}{\indexname} % puts entry in TOC
\begin{singlespace}
\printindex
\end{singlespace}
```

Remember that you must run LaTeX (or pdfLaTeX), then `makeindex`, then LaTeX(or pdfLaTeX) again. WinEdt has a menu item to run makeindex, but other Windows editors may not. If you don't have a menu item, you'll need to open a command window and `cd` to the appropriate directory/folder) to run makeindex.

---

[2]A good overview of how to use natbib is at
http://www.ctan.org/tex-archive/macros/latex/contrib/natbib/natnotes.pdf

6   Your Final Output: Creating the PDF Files

Rensselaer requires that electronically-submitted theses or dissertations be in Adobe Portable Document Format (PDF), the current standard for electronic information exchange. PDF files look exactly like the original documents and are viewable and printable on any platform. Remember that you need to make two PDF files: one containing the complete thesis or dissertation and the other containing just the Abstract Title Page and abstract.

After you have written your thesis in LATEX, it is straightforward to convert your `.tex` files to PDF. There are two widely-used methods:

1. The traditional way is to run LATEX followed by `dvips` to create a PostScript file and then convert that to PDF. On Windows, you can do the conversion by opening the `.ps` file with GSView and using menu items to convert to PDF; on unix/Linux systems, you run the `ps2pdf` program (part of ghostscript).

2. A simpler method is to use the relatively recent program pdfLATEX, which processes your LATEX file and produces a PDF file directly. On Windows systems, your editor/shell (e.g., Win-Shell, WinEdt) has a pdfLATEX button on the menu bar; on UNIX systems you type `pdflatex filename` on the command line.[3]

This is simple enough. Unfortunately, a complication arises when you consider included graphics. (See section 7 for how to include graphics in a LATEX file.) When you use the traditional conversion method (LATEX plus `dvips`), your graphics files must be in eps (Encapsulated PostScript) format. But when you use pdfLATEX, it accepts the formats pdf, jpg, and png, but *not* eps. If you want to use pdfLATEX and your graphics files are in eps format, a solution is to convert them to pdf using the `epstopdf` utility, which is most likely on your system.

For detailed instructions on creating the PDF files, including how to manage graphics files and how to make hyperlinks, see *Creating a PDF File from a LATEX Thesis*, at
http://www.rpi.edu/dept/arc/docs/latex-thesis/latextopdf.pdf.

7   Including Graphics

You can use a variety of applications to create your graphics. Maple, MATLAB, CorelDRAW, Xfig, Gnuplot, and even Windows applications such as Word or Excel are common choices. If you are using LATEX plus `dvips` to produce your final output, you should save the graphic as *encapsulated PostScript* (EPS), not plain PostScript. If you are using pdfLATEX, you can save it as pdf, jpg, or png.

To import graphics, you first need to load the `graphicx` package in your preamble:

```
\usepackage{graphicx}      % Note the "x" in "graphicx"
```

And then, at the spot you want to insert the graphic (for example, `myfigure.eps` or `myfigure.pdf`) use the `\includegraphics` command:

```
\includegraphics{myfigure}  % note filename extension is omitted
```

---

[3]Acrobat Reader cannot automatically update the view if you reprocess your document, unlike `xdvi` and `GSview`. You have to close the display with **Ctrl-W** and reload the file with **Alt-←** (left arrow). Or, you can configure your editor to view PDF files with GSView instead of Acrobat.

If you want to be able to use either `pdflatex` or `latex` on the same file, you'll need to have your graphics files in both eps format and one of the others, such as pdf. Then omit the filename extension on the `\includegraphics` command: `latex` will look for an eps file, and `pdflatex` will look for a pdf, jpg, or png file. The `\includegraphics` command also provides optional arguments for scaling or rotating the figure. Assuming you have a file named `myfigure.eps` or `myfigure.pdf` (or both), the command, which usually goes inside the `figure` environment, will look something like:

```
\includegraphics[width=4in]{myfigure}
```

There is more information on the `\includegraphics` command in *Text Formatting with LaTeX*. Official documentation for the graphics package is in the file `grfguide.pdf`; look for it on your system. The information on including graphics is in Section 4.4.

After you have put the appropriate commands for including graphics into your LaTeX file, you can run pdfLaTeX and view the result with Acrobat or GSView. If you create a `.dvi` file by running LaTeX and then view it with your previewer, most of the time the previewer will be able to display the included PostScript graphics (by calling the `ghostscript` program). However, there may be some cases, for example if the graphic is in landscape orientation, where it is not displayed properly. In this case, you can use `dvips` to put the output in a PostScript file which will display the result correctly.

There is a wealth of information in *Using Imported Graphics in LaTeX2e*, a PDF document by Keith Reckdahl of Stanford University. It includes all you would ever want to know with many examples. You can find it at:
http://www.ctan.org/tex-archive/info/epslatex.pdf.

8   Printing Landscape Figures and Tables

You can print figures or tables, along with their captions, in landscape orientation (sideways) through the use of the `rotating` package. To use this package, put the following command in your preamble:

```
\usepackage{rotating}
```

The `rotating` package defines two new environments, `sidewaysfigure` and `sidewaystable`, which can be used in place of the standard LaTeX environments `figure` and `table`.

Probably the easiest way to see how to insert figures (either portrait or landscape) or landscape tables is to look at examples. The file `exrotating.tex`, one of the example files on the LaTeX information web page, contains examples of using both the `graphicx` and the `rotating` packages. You can view the `.tex` file to see the LaTeX commands and the file `exrotating.ps` or `exrotating.pdf` to see the results.

You can run this file yourself by copying `exrotating.tex` to your own space, along with the .eps and/or .pdf files it uses. If you process it with pdfLaTeX, the resulting PDF file should look fine. If you process it with LaTeX, note that you should create a .ps file to view the result, as most dvi previewers cannot display landscape graphics or tables properly.

Appendix A
Template File for a Short Thesis

Filename: `rpithes-short.tex`

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%          Template for a short thesis all in one file          %
%        (titlepage info below assumes masters degree}          %
%  Just run latex (or pdflatex) on this file to see how it looks  %
%       Be sure to run twice to get correct TOC and citations     %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%
%  To produce the abstract title page followed by the abstract,
%  see the template file, "abstitle-mas.tex"
%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%


\documentclass{thesis}
\usepackage{graphicx}    % if you want to include graphics files

% Use the first command below if you want captions over 1 line indented.
% A side effect of this is to remove the use of bold for captions.
% To restore bold, also include the second line below.
%\usepackage[hang]{caption}      % to indent subsequent lines of captions
%\renewcommand{\captionfont}{\bfseries} % only needed with caption package;
                                   %   otherwise bold is default)
%%%%%%%%%%%%%%%%%%%%%%  supply titlepage info  %%%%%%%%%%%%%%%%%%%%%%%
\thesistitle{\bf Differential Equations\\On two lines}
\author{Sir Isaac Newton}
\degree{Master of Science}
\department{Mathematics} % provide your area of study here; e.g.,
%  "Mechanical Engineering", "Nuclear Engineering", "Physics", etc.
\thadviser{Galileo}
%\cothadviser{First co-adviser} %if needed
%\cocothadviser{Second co-adviser} % if needed
%  For a masters project use \projadviser instead of \thadviser,
%  and \coprojadviser and \cocoprojadviser if needed.
\submitdate{January 1685\\(For Graduation May 1685)}
%\copyrightyear{1685}  % if date omitted, current year is used.
%%%%%%%%%%%%%%%%%%%%%%   end titlepage info   %%%%%%%%%%%%%%%%%%%%%%%


\begin{document}
\titlepage              % Print titlepage
%\copyrightpage         % optional
\tableofcontents        % required
\listoftables           % required if there are tables
\listoffigures          % required if there are figures
```

```
\specialhead{ACKNOWLEDGMENT}
The acknowledgment text goes here. Unlike chapter headings,
this heading is not numbered.

\specialhead{ABSTRACT}
Write your abstract here. Again, the heading does not receive a number.

\chapter{INTRODUCTION}
The text of the first chapter goes here. To cite a reference for the
bibliography, use a command such as:\cite{thisbook}
\section{A Section Heading}
This is a sentence to take up space and look like text.
\subsection{A Subsection Heading}

\chapter{THE NEXT CHAPTER}
And so on, for more chapters.
Another citation for the bibliography:\cite{anotherbook}

% The following produces a numbered bibliography where the numbers
% correspond to the \cite commands in the text.
\specialhead{LITERATURE CITED}
\begin{singlespace}
\begin{thebibliography}{99}
\bibitem{thisbook} This is the first item in the Bibliography.
Let's make it very long so it takes more than one line.
Let's make it very long so it takes more than one line.
\bibitem{anotherbook} The second item in the Bibliography.
\end{thebibliography}
\end{singlespace}

%%%%%%%%%%%%%%%%%%%%%%  For Appendices  %%%%%%%%%%%%%%%%%%%%
\appendix     % This command is used only once!
\addtocontents{toc}{\parindent0pt\vskip12pt APPENDICES} %toc entry, no page #
\chapter{THIS IS AN APPENDIX}
Note the numbering of the chapter heading is changed.
This is a sentence to take up space and look like text.
\section{A Section Heading}
This is how equations are numbered in an appendix:
\begin{equation}
x^2 + y^2 = z^2
\end{equation}

\chapter{THIS IS ANOTHER APPENDIX}
This is a sentence to take up space and look like text.
\end{document}
```

Appendix B
Template Files for Abstract Title Page and Abstract

Filename: `abstitle-mas.tex`

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                                  %
%               ABSTRACT TITLE PAGE and ABSTRACT                   %
%                       Master's Thesis                            %
%                                                                  %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% This template file shows how to produce the abstract title page
%   followed by the abstract for a Master's thesis.
% To produce a PDF file in one step, just run pdflatex on this file.
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
\documentclass[chap]{thesis}

\begin{document}
% information for title page (copied from rpititle-mas.tex):
 \thesistitle{\bf Differential Equations\\On two lines}
 \author{Sir Isaac Newton}
 \degree{Master of Science}
 \department{Mathematics} % provide your area of study here; e.g.,
%  "Mechanical Engineering", "Nuclear Engineering", "Physics", etc.
 \thadviser{Galileo}
%\cothadviser{co-adviser} % if needed
%\cocothadviser{Second co-adviser} % if needed
 \submitdate{January 1685\\(For Graduation May 1685)}

% Produce abstract title page:
 \abstitlepage

 \pagenumbering{arabic} % numbering of abstract starts with arabic "1"
 \include{rpiabs}       %include file containing abstract
% or, if using format of "rpithes-short.tex", copy text of abstract here.
 \end{document}
```

Filename: `abstitle-phd.tex`

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                                  %
%              ABSTRACT TITLE PAGE and ABSTRACT                    %
%                        Ph.D. Thesis                              %
%                                                                  %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% This template file shows how to produce the abstract title page
%   followed by the abstract for a Ph.D. thesis
% To produce the PDF file in one step, just run pdflatex on this file.
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
\documentclass[chap]{thesis}

\begin{document}
% Supply information for title page (copied from rpititle-phd.tex):
 \thesistitle{\bf Differential Equations\\On two lines}
 \author{Sir Isaac Newton}
 \degree{Doctor of Philosophy}
 \department{Mathematics}  % provide your area of study here; e.g.,
%  "Mechanical Engineering", "Nuclear Engineering", "Physics", etc.
 \signaturelines{4}     % max number of signature lines is 7
 \thadviser{Galileo}
%\cothadviser{Second Adviser} % If you have 2 thesis advisers
 \memberone{Fig Newton}
 \membertwo{Copernicus}
 \memberthree{Aristotle}
   %\memberfour,\memberfive, \membersix can also be used (change \signaturelines)
 \submitdate{January 1685\\(For Graduation May 1685)}

% Produce abstract title page:
 \abstitlepage

 \pagenumbering{arabic} % numbering of abstract starts with arabic "1"
 \include{rpiabs}
 \end{document}
```

Appendix C
Template Files for Longer Thesis

Filename: `rpithes.tex`

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                          %
%                      ROOT FILE                           %
%  For a long thesis where chapters are in separate files. %
%  Titlepage information for a PhD thesis is selected.      %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%
%  Run LaTeX or pdfLaTeX on this file to produce your thesis.
%  To produce the abstract title page followed by the abstract,
%  see the file abstitle-phd.tex or abstitle-mas.tex.
%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

\documentclass[chap]{thesis}

% Use the first command below if you want captions over 1 line indented. A side
% effect of this is to remove the use of bold for captions (thesis default).
% To restore bold, also include the second line below.
\usepackage[hang]{caption}      % to indent subsequent lines of captions
\renewcommand{\captionfont}{\bfseries} % bold caption (needed with caption
                                       % package to restore boldface.)

%\includeonly{rpichap1}  % use \includeonly to process only
                         % the file(s) listed inside the braces
\begin{document}

%\include{rpititle-mas}   % titlepage material for Master's thesis or project
\include{rpititle-phd}  % titlepage material for PhD thesis
\include{rpiack}
\include{rpiabs}
\include{rpichap1}
\include{rpichap2}
\include{rpibib}
\include{rpiapp}

\end{document}
```

Filename: `rpititle-mas.tex`

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                                    %
%                            TITLE PAGE                              %
%               Master's Thesis or Master's Project                 %
%                                                                    %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%  This file produces the title page, copyright page (if requested)
%  and the Table of Contents, List of Figures and List of Tables.
%
%  To produce the abstract title page followed by the abstract,
%  see the template file, "abstitle-mas.tex"
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

% Supply information for use on title page:
 \thesistitle{\bf Differential Equations\\On two lines}
 \author{Sir Isaac Newton}
 \degree{Master of Science}
 \department{Mathematics} % provide your area of study here; e.g.,
%  "Mechanical Engineering", "Nuclear Engineering", "Physics", etc.
 \thadviser{Galileo}
%\cothadviser{First co-adviser} %if needed
%\cocothadviser{Second co-adviser} % if needed
%  For a masters project use \projadviser instead of \thadviser,
%  and \coprojadviser and \cocoprojadviser if needed.
 \submitdate{January 1685\\(For Graduation May 1685)}
 \copyrightyear{1685}   % if omitted, current year is used.

% Print titlepage and other prefatory material:
 \titlepage
%\copyrightpage         %optional
 \tableofcontents
 \listoftables          %required if there are tables
 \listoffigures         %required if there are figures
```

Filename: `rpititle-phd.tex`

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                                %
%                          TITLE PAGE                            %
%                          PhD Thesis                            %
%                                                                %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%  This file produces the title page, copyright page (if requested)
%  and the Table of Contents, List of Figures and List of Tables.
%
%  To produce the abstract title page followed by the abstract,
%  see the template file, "abstitle-phd.tex"
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

% Supply information for use on title page:
%
 \thesistitle{\bf Differential Equations\\On two lines}
 \author{Sir Isaac Newton}
 \degree{Doctor of Philosophy}
 \department{Mathematics} % provide your area of study here; e.g.,
%  "Mechanical Engineering", "Nuclear Engineering", "Physics", etc.
 \signaturelines{4}      %max number of signature lines is 7
 \thadviser{Galileo}
%\cothadviser{Second Adviser} % If you have 2 thesis advisers
 \memberone{Fig Newton}
 \membertwo{Copernicus}
 \memberthree{Aristotle}
     %\memberfour,\memberfive, \membersix
     % can also be used. Remember to change \signaturelines.
 \submitdate{January 1685\\(For Graduation May 1685)}
 \copyrightyear{1685}   % if omitted, current year is used.

% Print titlepage and other prefatory material:
%
 \titlepage
%\copyrightpage          % optional
 \tableofcontents
 \listoftables           % required if there are tables
 \listoffigures          % required if there are figures
```

Filename: `rpiack.tex`

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                           %
%                    ACKNOWLEDGMENT                         %
%                                                           %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

`\specialhead{ACKNOWLEDGMENT}`

```
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```

Filename: `rpiabs.tex`

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                          %
%                        ABSTRACT                          %
%                                                          %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

\specialhead{ABSTRACT}

This is a sentence used to take up space and look like text.
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This is a sentence used to take up space and look like text.
```

Filename: `rpichap1.tex`

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                          %
%                       CHAPTER ONE                        %
%                                                          %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

\chapter{THIS IS THE FIRST CHAPTER}

This is a sentence to take up space and look like text.
This is a sentence to take up space and look like text.

This is a sentence to take up space \cite{thisbook}.
This is a sentence to take up space and look like text.
This is a sentence to take up space and look like text.
Please refer to Figure~\ref{myfig}.  % Note \label command below

\begin{figure}
\centering
\vspace{2.0in} % normally the command here would be \includegraphics
\caption{This is the Caption for Figure 1 make it long to illustrate
how it looks when wrapped around to the next line}
\label{myfig}  % the \label command comes AFTER the caption
\end{figure}

This is a sentence to take up space and look like text.
This is a sentence to take up space and look like text.
This is a sentence to take up space and look like text.

\begin{table}
\caption[This is the Caption for Table 1]
          {This is the Caption for Table 1\cite{thisbook}}
%  Note entry in [] for list of tables; you don't want citation in the LOT.
\begin{center}
\begin{tabular}{lll}
Here's      & an          & example  \\
of          & a           & table    \\
floated     & with        & the      \\
\verb+table+ & environment & command. 
\end{tabular}
\end{center}
\end{table}
```

```
This is a sentence to take up space and look like text.
This is a sentence to take up space and look like text.

\section{This is a Section Heading}

This is a sentence to take up space and look like text.
This is a sentence to take up space and look like text.
This is a sentence to take up space and look like text.

\subsection{This is a Subsection Heading}

This is a sentence to take up space and look like text.
This is a sentence to take up space \cite{anotherbook}.
This is a sentence to take up space and look like text.

\subsubsection{This is a Subsubsection Heading}
This is a sentence to take up space and look like text.
This is a sentence to take up space and look like text.
Text before the footnote.\footnote{Here's the text of the footnote.}
Text after the footnote.
This is a sentence to take up space and look like text.
```

Filename: `rpichap2.tex`

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                          %
%                     CHAPTER TWO                          %
%                                                          %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

\chapter{THIS IS THE SECOND CHAPTER}
%\resetfootnote %this command starts footnote numbering with 1 again.
This is a sentence to take up space and look like text.
This is a sentence to take up space and look like text.

This is a sentence to take up space and look like text.
This is a sentence to take up space and look like text.

\begin{figure}
\centering
\vspace{2.0in}
\caption[A Shorter Caption for the List of Figures]
   {This is the Caption for the First Figure in Chapter 2.  It is a
    long, long caption; we do not want to put the whole thing in the
    List of Figures. A Shorter Caption can go in the square brackets.}
% If you like wrapped lines in the caption indented, see the root template
% file rpithes.tex for an example of using the caption package to do this.
\end{figure}

This is a sentence to take up space and look like text.
This is a sentence to take up space and look like text.
This is a sentence to take up space and look like text.
This is shown in table~\ref{mytable}.  % see \label below

\begin{table}
\caption{This is the Caption for Table 2}
\label{mytable}         % \label command must always come AFTER the caption
\begin{center}
\begin{tabular}{lll}
Here's      & another     & example  \\
of          & a           & table    \\
floated     & with        & the      \\
\verb+table+ & environment & command. \\
\end{tabular}
\end{center}
\end{table}
```

```
This is a sentence to take up space and look like text.
This is a sentence to take up space and look like text.

\section{This is a Section Heading}

This is a sentence to take up space and look like text.
This is a sentence to take up space \cite{yetanotherbook}.
This is a sentence to take up space and look like text.
This is a sentence to take up space and look like text.

\subsection{This is a Subsection Heading}

This is a sentence to take up space and look like text.
This is a sentence to take up space and look like text.
This is a sentence to take up space and look like text.
Text before a footnote.\footnote{Here's the text
of the footnote.}
Text after the footnote.

This is a sentence to take up space and look like text.
This is a sentence to take up space and look like text.
Text before another footnote.\footnote{Here's the
text of the footnote.}
Text after the footnote.
This is a sentence to take up space and look like text.
```

Filename: `rpibib.tex`

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                          %
%                      BIBLIOGRAPHY                        %
%                                                          %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

% This method produces a numbered bibliography where the numbers
% correspond to the \cite commands in the text. See the LaTeX manual.
%
\specialhead{LITERATURE CITED}
\begin{singlespace}
\begin{thebibliography}{99}
\bibitem{thisbook} This is the first item in the Bibliography.
Let's make it very long so it takes more than one line.
Let's make it very long so it takes more than one line.
Let's make it very long so it takes more than one line.
Let's make it very long so it takes more than one line.
\bibitem{anotherbook} The second item in the Bibliography.
\bibitem{yetanotherbook} Another item in the Bibliography.
\end{thebibliography}
\end{singlespace}

% This is an alternative method. It's a simple unnumbered bibliography
% with hanging indentation.
%
\specialhead{BIBLIOGRAPHY}
\begin{singlespace}
\bibentry This is the first item in the Bibliography.
Let's make it very long so it takes more than one line.
Let's make it very long so it takes more than one line.
Let's make it very long so it takes more than one line.
Let's make it very long so it takes more than one line.
Let's make it very long so it takes more than one line.
\bibentry The second item in the Bibliography.
\bibentry Another item in the Bibliography.
\end{singlespace}

% Note that, if you wish, you can use BibTeX to create your bibliography
% from a database. See section 5.6.2 for information.
```

Filename: `rpiapp.tex`

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                         %
%                      APPENDICES                         %
%                                                         %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

\appendix    % This command is used only once!
%\addcontentsline{toc}{chapter}{APPENDICES}              %toc entry  or:
\addtocontents{toc}{\parindent0pt\vskip12pt APPENDICES} %toc entry, no page #

\chapter{THIS IS AN APPENDIX}
This is a sentence to take up space and look like text.
This is a sentence to take up space and look like text.
This is a sentence to take up space and look like text.
This is a sentence to take up space and look like text.
\section{A Section Heading}
This is how equations are numbered in an appendix:
\begin{equation}
x^2 + y^2 = z^2
\end{equation}
This is a sentence to take up space and look like text.
This is a sentence to take up space and look like text.
This is a sentence to take up space and look like text.

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\chapter{THIS IS ANOTHER APPENDIX}
This is a sentence to take up space and look like text.
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```

Appendix D
Output from the Template Files for Longer Thesis

DIFFERENTIAL EQUATIONS
ON TWO LINES

By

Sir Isaac Newton

A Thesis Submitted to the Graduate

Faculty of Rensselaer Polytechnic Institute

in Partial Fulfillment of the

Requirements for the Degree of

DOCTOR OF PHILOSOPHY

Major Subject: MATHEMATICS

Approved by the
Examining Committee:

_____
Galileo, Thesis Adviser

_____
Fig Newton, Member

_____
Copernicus, Member

_____
Aristotle, Member

Rensselaer Polytechnic Institute
Troy, New York

January 1685
(For Graduation May 1685)

CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGMENT

This is a sentence to take up space and look like text. This is a sentence to take up space and look like text. This is a sentence to take up space and look like text.

This is a sentence to take up space and look like text. This is a sentence to take up space and look like text. This is a sentence to take up space and look like text.

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ABSTRACT

This is a sentence used to take up space and look like text. This is a sentence used to take up space and look like text. This is a sentence used to take up space and look like text.

This is a sentence used to take up space and look like text. This is a sentence used to take up space and look like text. This is a sentence used to take up space and look like text. This is a sentence used to take up space and look like text. This is a sentence used to take up space and look like text. This is a sentence used to take up space and look like text.

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This is a sentence used to take up space and look like text. This is a sentence used to take up space and look like text. This is a sentence used to take up space and look like text. This is a sentence used to take up space and look like text. This is a sentence used to take up space and look like text. This is a sentence used to take up space and look like text.

CHAPTER 1
THIS IS THE FIRST CHAPTER

This is a sentence to take up space and look like text. This is a sentence to take up space and look like text.

This is a sentence to take up space [1]. This is a sentence to take up space and look like text. This is a sentence to take up space and look like text. Please refer to Figure 1.1.

This is a sentence to take up space and look like text. This is a sentence to take up space and look like text. This is a sentence to take up space and look like text.

This is a sentence to take up space and look like text. This is a sentence to take up space and look like text.

Figure 1.1: This is the Caption for Figure 1 make it long to illustrate how it looks when wrapped around to the next line

Table 1.1: This is the Caption for Table 1[1]

Here's	an	example
of	a	table
floated	with	the
`table`	environment	command.

1.1   This is a Section Heading

This is a sentence to take up space and look like text. This is a sentence to take up space and look like text. This is a sentence to take up space and look like text.

1.1.1   This is a Subsection Heading

This is a sentence to take up space and look like text. This is a sentence to take up space [2]. This is a sentence to take up space and look like text.

1.1.1.1   This is a Subsubsection Heading

This is a sentence to take up space and look like text. This is a sentence to take up space and look like text. Text before the footnote.[1] Text after the footnote. This is a sentence to take up space and look like text.

---

[1]Here's the text of the footnote.

CHAPTER 2
THIS IS THE SECOND CHAPTER

This is a sentence to take up space and look like text. This is a sentence to take up space and look like text.

This is a sentence to take up space and look like text. This is a sentence to take up space and look like text.

This is a sentence to take up space and look like text. This is a sentence to take up space and look like text. This is a sentence to take up space and look like text. This is shown in table 2.1.

This is a sentence to take up space and look like text. This is a sentence to take up space and look like text.

Figure 2.1: **This is the Caption for the First Figure in Chapter 2. It is a long, long caption; we do not want to put the whole thing in the List of Figures. A Shorter Caption can go in the square brackets.**

Table 2.1: This is the Caption for Table 2

Here's	another	example
of	a	table
floated	with	the
`table`	environment	command.

2.1 This is a Section Heading

This is a sentence to take up space and look like text. This is a sentence to take up space [3]. This is a sentence to take up space and look like text. This is a sentence to take up space and look like text.

2.1.1 This is a Subsection Heading

This is a sentence to take up space and look like text. This is a sentence to take up space and look like text. This is a sentence to take up space and look like text. Text before a footnote.[2] Text after the footnote.

This is a sentence to take up space and look like text. This is a sentence to take up space and look like text. Text before another footnote.[3] Text after the footnote. This is a sentence to take up space and look like text.

---

[2]Here's the text of the footnote.
[3]Here's the text of the footnote.

LITERATURE CITED

[1] This is the first item in the Bibliography. Let's make it very long so it takes more than one line. Let's make it very long so it takes more than one line. Let's make it very long so it takes more than one line. Let's make it very long so it takes more than one line.

[2] The second item in the Bibliography.

[3] Another item in the Bibliography.

BIBLIOGRAPHY

This is the first item in the Bibliography. Let's make it very long so it takes more than one line. Let's make it very long so it takes more than one line. Let's make it very long so it takes more than one line. Let's make it very long so it takes more than one line. Let's make it very long so it takes more than one line.

The second item in the Bibliography.

Another item in the Bibliography.

APPENDIX A
THIS IS AN APPENDIX

This is a sentence to take up space and look like text. This is a sentence to take up space and look like text. This is a sentence to take up space and look like text. This is a sentence to take up space and look like text.

A.1 A Section Heading

This is how equations are numbered in an appendix:

$$x^2 + y^2 = z^2 \tag{A.1}$$

This is a sentence to take up space and look like text. This is a sentence to take up space and look like text. This is a sentence to take up space and look like text.

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APPENDIX B
THIS IS ANOTHER APPENDIX

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